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ABSTRACT

Reported is another study related to the Project on an Information Memory Model. The purpose of this study was to establish the possible relationships of personality characteristics with the processing of information by humans in an abstract problem solving task. Thirty senior high school students, each of whom had completed the Edwards Personal Preference Schedule (EPPS), were asked to take the role of court judge, deciding on divorce proceedings and custody assignments. The subjects were presented with a problem involving the incestuous relationship between nine people who had Greek-letter names. The subjects vocalized the five-minute solution and the monologues were noun, pronoun analyzed. Twenty-eight information theoretic measures and six external measures were calculated from the Gamma Problem (output was placed in a matrix and treated for information theoretic measures according to the Moser Model). Fifteen personality variables were obtained from the EPPS; nine were used in the analysis. The information theoretic measures, the external measures, and the personality variables were tested for relationships by linear regression analysis. Paradigms, involving data analyses, of the relationships of personality to the information in verbal solutions of the Gamma problem confirmed that personality was embedded in the fashioning of sequences of messages from the memory and for processing a desired state of affairs for a socially sensitive problem. (Author/PEB)

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INFORMATION MEMORY PROCESSING AND RETRIEVAL: RELATIONSHIPS OF PERSONALITY CHARACTERISTICS AND AN ABSTRACT PROBLEM SOLVING TASK.

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TABLE OF CONTENTS

	Page
Introduction	1
Purpose of the Problem	1
Procedure	2
Results	2
Conclusions	21
Bibliography	25
Appendix	26

LIST OF TABLES

Table		Page
1	Characteristics of Personality Factors for the Edwards Personal Preference Scale	3
2	Output Characteristics and Information Flow of the Verbal Processing of the Gamma Problem.	4
3	Significant Coefficients of Correlation Between Personality Factors	6
4	Significant Coefficients of Correlation Between Gamma Task Characteristics.	7
5	Significant Coefficient of Correlation Between Personality Factors and Gamma Task Characteristics. .	8
6	Significant Coefficients of Correlation Between Information Measures of the Gamma Task.	10
7	Significant Coefficients of Correlation Between Information Measures and Personality Factors.	11
8	Significant Coefficients of Correlation Between Information Flow and Task Characteristics of the Gamma Problem	12
9	Trend of the Relationship Between Levels of Personality Factors and the Code Information Processed in the Gamma Task	14
10	Trend of the Relationship Between Levels of Personality Factors and the Variety of Terms Used in the Solvency of the Gamma Problem	15
11	Level of Prediction of Personality Factors Using an M-Unit Dimension Algorithm	17
12	Significant Coefficients of Correlation Between Select Characteristics of the Gamma Task and the M-Unit of the Algarithm for Predicting Personality Factors	18
13	Significant Coefficients of Correlation Between Personality Factors and M-Unit Values and Algarithmically Obtaining Personality Factors . . .	20

INTRODUCTION.

Much of the activity that goes on in the classroom in our schools involves verbal behaviors. Investigation into perception, as well as recent studies of cognition by Bruner (1), reveal that the language we use is greatly affected by what we see and how we see it. Bever (2), reported in his study of speech performances and linguistic structure that certain structural properties of the grammar of language can be attributed, not to the individual's linguistic structure, but to the interaction between the process of verbal learning and behavioral strategies used by the individual to process actual sentences.

In an attempt to determine possible differences in child development through the acquisition of verbal fluency in different cultures, an interdisciplinary research group Ervin-Tripp (3), and Slobin (4), studied early stages of language development across cultures. The research showed that individual children go through strikingly similar stages of development in the acquisition of verbal fluency. The rate of development may vary from child to child between cultures, but the order of the stages seem to remain constant.

A study by Markel (5), investigated the effect of regional dialect on judgement of personality from verbal output. A semantic differential procedure was used to obtain ratings from observers. There was a significant difference between the ratings of the speakers from different regions. In another study involving verbal output and personality, Scherer (6) reported that, if peer ratings are accepted as valid external criteria of personality, listener-judges can correctly identify such personality traits as extroversion and sociability. Since student verbal behavior involves the personality, the study of the quantitative relationship of the two becomes a worthy area of research.

This study was done to determine the relationship between quantitative values obtained from the information theoretic measures of the verbal problem solving cognitive task and the personality variables obtained from the Edwards Personal Preference Schedule (EPPS) (7).

The model used to obtain the information theoretic measures has been developed by Moser (8) and is based on the engineering aspects of communication. Moser (9), very recently refined the model to where it can now be used to describe information processing of the cognitive task of problem solving, performed in various modalities of output. The specific modality used in this study was verbal.

Purpose of the Problem.

Many kinds of human behaviors have been studied with interpretations from the Moser Memory Model (10). It has been found that the sentences of verbal material can be analyzed for the human processing of memory recall and problem solving tasks in instructional and interactive modes. The information processed has been found related to the source, or environment task perceived by the humans. In 1971, Moser developed an abstract problem for humans to solve through verbal treatment (11). The exemplars were constructed in a sequence to correspond to an information measure (NOISE:X) which was found to define the subjects' perception of the environment task. Moser recently reported that the information flow in the verbal processing of the abstract problem was linearly related to several immediate and delayed cognitions for a figural sorting task done by the same adult subjects (10).

The abstract problem is of an incestuous relationship between nine Greek-named persons; the solver is to play the role of a judge awarding custody assignments. The nature of the theme prompted the research question that humans processing the solution would display personality traits in its verbal treatment. This study was then done to test that research question.

Procedure.

The subjects of this study were 30 seniors enrolled in a suburban high school during the 1973-74 academic year. Students volunteered to participate in the experiment. The subjects took the Edwards Personal Preference Schedule (7) (EPPS). This schedule consisted of 225 pairs of statements about things that an individual may or may not like; about ways in which an individual may or may not feel. The subject had to decide which statement in the pair was more characteristic of himself or herself. If both statements described how the individual felt then the individual had to choose the one which was more characteristic. If neither statement accurately described how the individual felt, then he chose the one which was considered to be less inaccurate. There was no limit set on the time it took to complete the EPPS. The average time required about 50 minutes for the subjects to complete the EPPS. Some subjects took longer than this and some completed the EPPS in a shorter period.

Each of the thirty subjects was asked to solve an abstract problem which was read from a typewritten page. The problem involved the incestuous relationship between nine people who had Greek-letter names. The subjects were to take the role of a court judge, deciding on divorce proceedings and custody assignments. The problem statement was two hundred and twenty-four words in length. The term location and wording of the sentences were specially constructed to establish a source which was a problem (11). The subjects each spent five minutes verbally "solving" the problem. The audio-tapes were noun-term analyzed and compared to the terms located in the source which contained eighty-seven terms (messages) and a variety of twenty-six. Each subject's output was placed in a matrix and treated for information theoretic measures according to the Moser Model (9). This task will hereafter be referred to as the "Gamma" Problem.

Twenty-eight information theoretic measures and six external measures were calculated from the Gamma Problem. Fifteen personality variables were obtained from the EPPS; nine were used in the analysis. The information theoretic measures, the external measures, and the personality variables were tested for relationships by linear regression analyses.

Results.

The characteristics of personality factors and the processing of the Gamma Problem by the 30 high school senior subjects are listed in Tables 1 and 2. The maximum score for each personality factor was 26 points (7). The range of factor scores was 7.8 to 15.4 for high school seniors. Intraception and affiliation were the factors with the greater scores. It should be kept in mind that the personality instrument was administered at a different time than when the subjects individually did the verbal treatment of the Gamma problem.

TABLE 1

Characteristics of Personality Factors
for the Edwards Personal Preference Scale

Personality Factor		$\bar{X}$	S.D.
Intraception	(INTR.)	15.43	5.51
Affiliation	(AFF.)	15.13	4.68
Change	(CHG.)	13.77	6.11
Succorance	(SUC.)	11.60	5.34
Abasement	(ABA.)	13.53	5.80
Nurturance	(NUR.)	14.80	5.19
Endurance	(END.)	9.10	5.17
Order	(ORD)	7.77	4.26
Aggression	(AGG.)	12.13	4.07

The subjects solved the Gamma Problem by verbally processing an average of 53.9 coded (by noun, pronoun term analysis) messages in a five-minute period. In other words, a message was coded every six seconds in the term analysis. This is believed to be a fairly reliable representation of the verbal treatment content of the problem solving task done by the subjects. The subjects used an average variety of 21.03, or slightly more than one of every three messages was a new term. This means there was a 39 percent average redundancy of message output by subjects.

The message and variety data of the subjects were analyzed as to which words were located in the Gamma problem statement and which were not, or had originated from the memory of each subject. It was found that 44.8 percent of the variety was from the source or problem statement. However, 61.1 percent of the messages were from the source statement. In other words, a greater redundancy of messages, of a lower variety of verbal material output by the subjects originated from the problem statement. T-tests of the variety and messages origins were found to be significant (at the .05 level for 38 degrees of freedom) for both kinds of variables. These findings indicated that subjects tended to verbalize more different terms from their memories, but to use a greater number of messages or words from the problem statement than from their own memory.

The average information measure values of the verbal solutions of the Gamma problem are listed in Table 2. These statistics are de-

TABLE 2

Output Characteristics and Information Flow
of the Verbal Processing of the Gamma Problem Task

Characteristic	$\bar{X}$	S.D.
A. Task		
Variety of Terms	21.03	6.19
Messages	53.87	22.73
Variety from Source	9.43	3.58
Variety Not from Source	11.90	5.20
Messages from Source	32.93	18.36
Messages not from Source	21.90	11.27
B. Information Flow		
CODE	2.4236	.7485
% CODE	.7424	.5670
REAL:M^1	2.5833	.6462
% REAL:M^1	.4774	.1304
LTM:M^1	0.0790	0.0400
% LTM:M^1	.0313	.0211
NOISE:X	.3422	.0918
H(Y)SS	4.7275	.5013
REAL:SS	0.7356	0.2193
%REAL:SS	.0925	.0280
A_1 (Difference Source and Process LTM:M^1)	+0.0046	0.0432
A_2 (Difference Source and Process REAL:SS)	-0.3726	0.3319

scriptive, with the exception of three measures which need an interpretation. It was previously mentioned that the Gamma problem was designed in a statement sequence to display a problem, as to the level of original matrix input channel spuriousness (NOISE:X:M^1). The level of spuriousness was set to be close to forty percent (actually it was found to be 39.7 percent). It was found that the 30 twelfth grade subjects processed the task with an average of 34.2 percent NOISE:X:M^1). According to Moser (8), this would be interpreted as a perceptional problem solving strategy. The interpretation was that the subjects regarded the problem as one to be processed as a problem, but as one of a lower level than originally intended in the construction of the problem.

The LTM:M^1 and REAL:SS measure values of the Gamma problem statement was compared to those of each subject, in their verbal solution of the problem. These comparisons are presented in Table 2 as A_1 and A_2, respectively. The treatment was done to ascertain the change of useful information levels of processing in the solution performance of the task by subjects. The hypothesis was that the problem had information pathway characteristics unique as to the content or structure of original and steady state matrix condition useful information. The perfect match of a task processing of the problem and the structure of perceptual set for the task processing would have obtained a zero difference in memory information treatments. A comparison of source information values and active useful information processing indicated there was a greater change in the REAL:SS information level than there was for the LTM:M^1 (A_1) measure. Moser (9) has postulated the concept that the steady state (SS) condition of information measure values represent information flow in the long term memory. The interpretation of the findings in this study would be that there was a greater incongruence of long term memory useful information than there was for the short term memory useful information, in the verbal solution of the abstract problem.

The dependence relationships between personality factors, listed in Table 3, were not large for the high school seniors who participated in the study. Nurturance and abasement, affiliation, aggression, nurturance, and endurance, and intraception were incompletely related to each other, but there was only one-quarter the expected significant coefficients of correlation.

The comparison of significant coefficients of correlation between the variety and number of messages verbalized by the subjects revealed an interesting finding. Even though the expected interrrelationships were found between the message and variety variables, it was somewhat surprising to find no direct relationship existed (see Table 4) between the messages and variety originating from the problem statement and their counterparts representing words and different kinds of words having their origins from the memories of the subjects. There was also no linear relationship between the variety of messages from the problem statement and the messages used for verbally solving the problem, and originating from the subjects.

TABLE 3

Significant Coefficients of Correlation* Between Personality Factors (EPPS)

Personality Factor	1	2	3	4	5	6	7	8	9
1) INTR.									.37
2) AFF.				.45		.71			
3) CHG.									.38
4) SUC.						.60			
5) ABA.						.32			
6) NUR.							-.38		
7) END.								.71	.41
8) ORD.									
9) AGG.									

*Significant at the .05 level as .36, and .31 at the .10 level.

TABLE 4

Significant Coefficients of Correlation*
Between Gamma Task Characteristics

Task Characteristic	1	2	3	4	5	6
1) Variety of Terms		.76	.72	.81	.59	.57
2) Messages			.63	.59	.84	.55
3) Variety from Source					.79	
4) Variety Not from Source						.81
5) Messages from Source						
6) Messages Not from Source						

*Significant at the .05 level as .36.

There were few significant coefficients of correlation found between personality factors of the subjects and the variety of verbalized messages and the amounts of coded messages used in solving the Gamma problem. As shown in Table 5, the three factors of affiliation, abasement, and succorance were linearly related to the variety of terms characteristic. Only one personality factor, change, was linearly related to the number of messages, and these were of the messages originating from the problem statement. The variety of words not originating from the problem statement was linearly related with the affiliation, succorance, and abasement factors. Moreover, the affiliation factor was linearly related to the variety, in general, and that used from the problem statement. In that all of the significant coefficients of correlation were negative, a trend of personality relationships could be construed for the variety traits of the abstract problem solving verbal behaviors.

Linear regression analysis between information measures was done to establish the linear operator information pathway through the proposed memory model. The major findings were the nature of linear relationships of measures with the useful information of the steady state condition (REAL:SS). The processor elements (REAL:M^1 and % REAL:M^1) were negatively related to REAL:SS, whereas the spuriousness of input messages of the original matrix condition (NOISE:X:M^1) was positively related. The ratio for chunking effect (% LTM:M^1) was found to be negatively related to the encoder (% CODE) and positively related to the NOISE:X:M^1 information measure.

The useful information components of the original and steady state conditions were found to be directly related to each other. These linear relationships indicated information "carried" by a channel message followed pathways of either encoders or processors, directly or indirectly, between the original and steady state conditions.

TABLE 5

Significant Coefficients of Correlation* Between Personality Factors (EPPS) and Gamma Task Characteristics

Personality Factor	Task Characteristic					
	Variety	Messages	Variety		Messages	
			From Source	Not from Source	From Source	Not from Source
1) INTR.						
2) AFF.	-.33		-.35	-.33		
3) CHG.						-.36
4) SUC.	-.32			-.33		
5) ABA.				-.38		
6) NUR.						
7) END.						
8) ORD.						
9) AGG.						

*Significant at the .05 level as .36, and .31 at the .10 level.

The verbal treatment of the abstract problem by subjects in the experiment was previously described as involving the use of words from the problem statement (source) and words originated by the senior class high school students. A unique analysis was done to compare the difference of useful information measures of the source and those "carried" by the average messages verbalized by the subjects. These are identified as A_1 and A_2 in Table 6. The A_1 symbol represents the differences between the source LTM:M^1 measure value and the same measure of information of the verbal material of the subjects. The A_2 measure is the same kind of variable, but representing the steady state useful information (REAL:SS). It, therefore, was expected the A_1 and A_2 measures would be significantly correlated (see Table 6) with the REAL:SS and LTM:M^1 measures of the verbal material of the subjects. The interesting finding was that no other measures, with the exception of H (Y) SS, were linearly related to the A_1 and A_2 comparisons. The reasoning is that if NOISE:X:M^1 was significantly correlated with REAL:SS of the same verbal material, then why wasn't NOISE:X linearly related to the counterpart A_1 comparison between the source REAL:SS and that of the verbal material of each subject?

The linear analysis treatment for relationships between personality factors and information measures, shown in Table 7, indicated few of them were significant. Nevertheless, there was a pattern for the significant relationships. One of these was the positive correlations between the chunking effects (LTM:M^1 and % LTM:M^1) of the short term memory, its counterpart comparison with the source information (A_1), and the endurance and order personality factors. Noticeably absent were linear relationships between steady state useful information (REAL:SS) and the nine personality factors. The direction of linear regressions revealed a contrast of relationships between the abasement factor and % CODE and NOISE:X:M^1 information measures.

The findings of information flow for personality factors and those for verbal material characteristics differed somewhat in the linear relationships which were significant. As shown in Table 8, the steady state useful information measures (REAL:SS and % REAL:SS) were significantly correlated to these variables, whereas the original matrix useful information was found to be linearly related to personality factors. The major finding for this analysis was that REAL:SS was correlated with the variety and number of messages the subjects used redundant to the problem statement (source). In fact, it was the only type of studied information measure to have such a dichotomous relationship. Another pattern was that three information measures were positively correlated with the variables of variety from the source and not from the source as well as messages not from the source. These measures were CODE, REAL:M^1, and H (Y) SS (steady state). By referring to Table 6, it is possible to hypothesize these relationships were by an informational pathway of H (Y) SS relating the CODE information to that of REAL:M^1.

The pathways established by the linear relationships previously described, offered the opportunity to do trend analyses between information flow and levels of personality factors (12). The reader should

TABLE 6

Significant Coefficients of Correlation* Between Information Measures of the Gamma Task

Information Flow	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1) CODE		-.38		.52			-.34	.52		-.36		
2) %CODE			-.49	-.43		-.38						
3) REAL:M^1				.89			-.67	.41	-.32	-.55		
4) %REAL:M^1							-.82		-.56	-.67		
5) LTM:M^1									.43	.44	.98	
6) %LTM:M^1							.51		.48	.48	.91	
7) NOISE:X:M^1									.54	.64		
8) H (Y) SS									.59			.37
9) REAL:SS										.94	.46	.48
10) %REAL:SS											.48	.44
11) A_1												.42
12) A_2												

*Significant at the .05 level as .36, and .31 at the .10 level.

TABLE 7

Significant Coefficients of Correlation* Between Information Measures and Personality Factors (EPPS)

Information Measure	Personality Factor								
	INTR.	AFF.	CHG.	SUC.	ABA.	NUR.	END.	ORD.	AGG.
CODE	.31								.30
% CODE					-.34				
REAL:M[1]		-.37							
%REAL:M[1]									
LTM:M[1]							.31	.39	
%LTM:M[1]								.33	
NOISE:X:M[1]					.41				
H(Y)SS		-.36		-.32					
REAL:SS									
%REAL:SS									
A_1								.38	
A_2									

*Significant at the .05 level as .36 and .31 at the .10 level.

TABLE 8

Significant Coefficients of Correlation Between the Information Flow and Task Characteristics of the Gamma Problem

Information Measure	Task Characteristics					
			Variety		Messages	
	Variety	Messages	From Source	Not From Source	From Source	Not From Source
CODE	.58	.43	31	.53		.40
%CODE						
REAL:M[1]	.53		.31	.42		.37
%REAL:M[1]					-.31	
LTM:M[1]						
%LTM:M[1]						
NOISE:X:M[1]		.35			.39	
H(Y)SS	.69		.37	.61		.56
REAL:SS	.36	.52	.35		.58	
%REAL:SS	.31				.44	
A_1						
A_2					.37	

keep in mind that as the trends are obtained from linear analyses, the trend values have a 90 percent level of approximation. The trend of relationship between the CODE information measure and nine personality factors is shown in Table 9. These data are to be read in terms of the personality factor score limits: from zero to a maximum of twenty-six. It was found that the dependence change of CODE was in the same direction for the increase of levels for the intraception, aggression, abasement, and endurance, with the former two personality factors having the greatest gain for the CODE measure. The CODE measure is expressed as $H(X)\,M^1 - H_X(Y)\,M^1$. In other words, CODE represents the change in uncertainty occurring between an independent message and the information of a second message when it is known what is the preceding message. Then as a descriptor for the memory encoding process content the interpretation was that more encoding content information per verbal message occurred for higher personality levels of intraception and aggression. The increasing level of order, in contrast, showed a decreased amount of CODE information for a message verbalized in solving the abstract problem.

A study of the trend of relationships between the levels of personality factors and the variety of verbal material was done for comparison (see Table 10) with the previously described trend analysis of CODE information. As CODE and Variety were linearly related, the expected variances of intraception and aggression and variety were observed as a trend. However, the indirect relationship of CODE and the change factor showed an opposite trend with a variety change of a magnitude comparable to that of intraception. In other words, as there was an increase in the subjects level of change personality there was a decrease in the variety of words used to process the Gamma problem solution.

The findings presented thus far indicate there was a multiple relationship between verbal material characteristics, information flow, and personality factors. It was hypothesized that possibly personality was in some way embedded in either the verbal treatment data or related to information flow of the abstract problem solving task. It was decided to test the applicability of an M (memory) type of algorithm to identify the unit of structure of information involved in personality expressions. Moser (13) recently reported the development of the concept that information storage units approximate a value of 0.1548 bit. The encoder-processor content of the memory model was selected because it was believed personality would be expressed through ways in which it is processed from the memory into verbal output about an environment set such as the Gamma problem. An analysis of regression coefficients indicated the personality factors of intraception, affiliation, and change should be tested with the encoder (CODE) content information, and the other six factors with the processor ($REAL:M^1$) content information.

The encoder algorithm was expressed as CODE/M unit equals a personality factor. The processor algorithm was ($REAL:M^1$M unit)/% $REAL:M^1$ equals a personality factor. The nine personality factors of each of the 30 subjects were tested as to goodness of fit for

TABLE 9

Trend of the Relationship Between Levels of Personality Factors and the CODE Information Processed in the Gamma Task

Factor Level	INTRA.	AFF.	CHG.	SUC.	ABA.	NUR.	END.	ORD.	AGG.
0	1.77	2.88	2.62	2.69	2.20	2.76	2.35	2.84	1.70
5	1.98	2.73	2.55	2.58	2.28	2.65	2.39	2.57	2.00
7	2.07	2.67	2.52	2.53	2.32	2.60	2.41	2.46	2.12
10	2.19	2.58	2.48	2.46	2.36	2.53	2.43	2.30	2.30
15	2.41	2.43	2.40	2.34	2.45	2.42	2.48	2.04	2.60
20	2.62	2.28	2.33	2.23	2.53	2.30	2.52	1.77	2.89
25	2.83	2.13	2.26	2.11	2.61	2.19	2.56	1.50	3.19
26	2.88	2.10	2.24	2.07	2.63	2.17	2.57	1.45	3.25
RANGE	+1.11	-0.78	-.38	-.62	+.43	-.59	+.20	-1.39	+1.55

TABLE 10

Trends of the Relationship Between Levels of Personality Factors and the Variety of Terms Used in Solving the Gamma Problem

Factor Level	INTR.	AFF.	CHG.	SOC.	ABA.	NUR.	END.	DRD.	AGG.
0	17.9	23.2	23.9	22.3	20.0	22.6	20.7	23.0	17.6
5	18.9	22.5	22.9	21.8	20.4	22.1	20.9	21.7	19.0
7	19.3	22.2	22.4	21.5	20.5	21.9	21.0	21.2	19.6
10	19.9	21.8	21.8	21.2	20.8	21.6	21.1	26.5	20.4
15	20.9	21.1	20.8	20.7	21.1	21.0	21.3	19.2	21.9
20	22.0	20.3	19.7	20.1	21.5	20.5	21.5	17.9	23.3
25	23.0	19.6	18.7	19.6	21.9	19.9	21.7	16.6	24.2
26	23.2	19.5	18.5	19.3	22.0	19.8	21.7	16.5	25.0
RANGE	+5.3	-3.7	-5.4	-3.0	+2.0	-2.8	+1.0	-6.5	+7.4

forecast by the algorithms. The M unit of .1548 bit was allowed to vary in a progression series: 1/6, 1/3, 1/2, 2/3, 1 1/3, and two times the .1548 bit value of information. The program was to continue selecting an M unit series element until an obtained personality factor matched the actual factor score of an individual subject. It was found the progression series values of M unit had to be rejected in the fitness of a forecast to an actual personality nine times out of 270 predictions. This meant that in 3.3 percent of the predictions the selected series of M unit values could not predict the personality factor of an individual subject. Quite interestingly the variations of M unit were .4644, .6192, .7740, and .9288 bit, or geometric expansions of the .1548 bit M unit hypotehesized to be the unit of memory information structure. The average predicted and actual personality scores for each of the 30 individual predictions, of the nine personality factors are reported in Table 11. The greatest error of prediction was 8.7 percent and the lowest average error was 2.25 percent. The mean amount of the M unit was .1609 bit (variance of .0084 bit) or a difference of 3.9 percent from the postulated value of .1548 bit for a unit structure of memory information.

The M unit forecast model was then tested for linear relationship with various information measures and verbal task processing characteristics. The results of the test are shown in Table 12. It can be seen that, by referring to Table 7, the number of linear relationships which were significant had doubled from those only between information measures and personality factors. In every other case, where significant coefficients of correlation existed between personality factors and information measures (see Table 7) the direction of the linear relationship shifted. The same kind of shift, as compared to Table 8, occurred for task behaviors. These shifts in direction of relationship occurred for the affiliation and succorance factors.

The estanlishment of new linear relationships as a consequence of comparisons of M unit personality factors showed some striking patterns. The NOISE:X:M^1 information measure was significantly correlated with seven of the nine personality factor M units. Where the personality factor of change had not been significantly correlated with either information measures or verbal task characteristics it was now positively related to the NOISE:X measure. Keeping in account the nature of the encoder equation of the algorithm the interpretation was that the M unit would decrease as the change factor of a subject increased.

The order and aggression personality factors were unique in that both had M unit characteristics which were linearly related to short term and long term memory information measures. No other M units of factor were found to be significantly correlated with useful information measures. The LTM:M^1 and its source comparison element, A_1, both changed from a positive relationship to a negative one when linearly related with the order factor M unit. Whereas, there was no significant correlation between the aggression factor and REAL:SS there was now a negative correlation for the aggression M unit.

The M unit derivations for each personality factor of the 30 senior high school subjects were tested for linear relationships with the personality factor scores obtained by the subjects in taking the

TABLE 11

Levels of Prediction of Personality Factors,
Using an M-Unit Dimension Algorithm

Personality Factors	Personality Factor					
	M-Unit		Obtained		Actual	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
A. Steady State Encoding Process:						
Intraception	.1412	.0357	16.77	3.07	15.43	5.51
Affiliation	.1603	.0673	15.78	4.36	15.13	4.68
Change	.2057	.1401	14.04	4.88	13.77	6.11
B. Original Condition Information Processing:						
Abasement	.1266	.1435	14.55	6.02	13.53	5.80
Aggression	.1098	.0626	12.52	3.30	12.13	4.07
Endurance	.1640	.1442	9.73	5.29	9.10	5.17
Nurturance	.0975	.0602	15.35	5.26	14.80	5.19
Order	.2535	.2795	8.21	4.38	7.77	4.26
Succorance	.1386	.1016	11.96	5.46	11.60	5.34

TABLE 12

Significant Coefficients of Correlation* Between Select Characteristics of the Gamma Task and the M-Unit of the Algorithm for Predicting Personality Factors (EPPS)

Select Characteristics	INTRA.	AFF.	CHG.	SUC.	ABA.	NUR.	END.	ORD.	AGG.	ALL
CODE	.35	.61						.40		.45
REAL:M^1		.43		.40	.33	.57		.36	.39	.49
LTM:M^1								-.36		
NOISE:X:M^1			.34	-.40	-.63	-.59	-.42	-.33	-.68	-.55
REAL:SS									-.44	
H(Y)SS		.55		.32						
A_1								-.37		
A_2										
Variety		.53		.41						
Messages	.41	.44						-.38		
Variety from Source	.37	.52		.40		.34				
Variety not Source		.36								
Message from Source	.35			.33				-.34		
Messages not Source										

*Significant at the .05 level as .36, and .31 at the .10 level.

Edwards Personal Preference Scale (7). The linear analysis was done to find out if there would be any shift of interdependencies of personality behavior observations (EPPS) and the personality factor developed as a function of the unit structure of memory information hypothesized by Moser (13). The reader is advised to compare significant coefficients of correlation found in Table 3 and those presented in Table 13. As shown in Table 3, the intraception factor was linearly related to the aggression factor. However, that relationship did not exist for the M unit values of the aggression factor. Instead, intraception was now found to be linearly related to M unit personality structures for the affiliation and change factors. It was found that five of the nine linear relationships of the correlational tests on Table 3 were still linear relationships of sufficient significance to be listed in Table 13. In other words, five of the thirteen significant correlations, on Table 13, were existing between personality factors and between personality factors and the M unit value of personality structures.

These findings tend to indicate the M unit algorithm treatment established new linear relationships of personality factors, particularly when it is kept in mind the new relationships are of dependence on information structure transformations of personality factors of the subjects in the study.

TABLE 13

Significant Coefficients of Correlation* Between Personality Factors and M-unit Values for Algorithmically Obtaining Personality Factors

Actual Personality Factor	M-Unit Personality Value								
	INTR.	AFF.	CHG.	SUC.	ABA.	NUR.	END.	ORD.	AGG.
INTR.		.61	.34						
AFF.				.43				.36	
CHG.									
SUC.					.33	.56			.41
ABA.						.53	.59		.70
NUR.									.58
END.								.38	.47
ORD.									
AGG.									

*Significant as .36 at the .05 level, and .31 at the .10 level.

Conclusion and Discussion.

The study reported herein, was done to explore the intradependencies of personality, information flow of the human memory, and the words verbalized by young adult subjects in solving an abstract problem of incestuous relationships.

The preceding section on results was purposely kept brief and unbiased in the presentation. This was done because it may seem far-fetched that personality factors are indeed related to the information flow describing the human verbal behaviors in a problem solving task. More astounding is the development of equations, using information theoretic measures, of a recently discovered information bit value for the unit structure of the human memory (13); which when used describe personality factors. As these claims and conclusions may confound the reader's perspective of learning research, we have kept the results section as sparse as they are in this report. The reader of this mental set can disregard the following discussion and conclusions, as they are presented as an information theorist would interpret the findings.

The interpersonality profile of the young adult subjects showed two subgroups of EPPS factors being interrelated on a linear basis. The factors of abasement, affiliation, nurturance, and succorance were positively and directly and indirectly related to each other. The second subgroup of directly and indirectly related factors were aggression, change, endurance, order and intraception. The relationship between subgroups was by a negative link between nurturance and endurance.

The first subgrouping seemed to mean that interrelationships were of personal feelings of guilt and seeking and gaining help or empathy from friends with whom the subjects were loyal. An examination of information measure relationships with factors of this subgroup (see Table 7) showed the significant measures as being % CODE, REAL:M^1, H (Y) SS and NOISE:X: with all but the latter having negative dependences.

The second subgrouping was interpreted to profile a self-analysis for endurance and aggressiveness for change and endurance in an organized manner. The information measures related to these factors were CODE, LTM:M^1, or short term memory information encoding and the useful information chunking effect.

The personality factors were, with one exception, all related to the verbal output behaviors of the solution of the abstract problem by relationships of the first subgrouping of the personality profile of the high school senior subjects (see Table 5). These linear relationships were of personality factors and the variety characteristics of the treatment of the problem. These were negative relationships, implying that an increase of variety decreased the feelings of personal guilt and seeking or gaining help or empathy from loyal friends. The exception to this pattern involved a negative relationship between the change factor of personality and the number of messages, not variety, used in verbally solving the abstract problem.

A study of Tables 5, 7, and 8 show how personality factors were related to the processing of information for effecting the variety of verbal statements in solving the problem. Affiliation was negatively related to the REAL:M^1 measure and to the variety originating in the human memory. On the other hand, the REAL:M^1 measure was positively related to the variety and number of messages originating from the human memory. Thus a loop of feedback controls related affiliation to new words and kinds of words output with a directly dependent amount of useful information shared between consecutive output messages. Succorance and affiliation, being related to each other, had representations of dependence between the H (Y) SS measure and the number of different words originating from the human memory and not from the problem statement. The REAL:M^1 measure was positively related (see Table 6) to H (Y) SS and therefore, a multifacted relationship was dichotomously operating between measured personality factors (affiliation and succorance) and information measures for the memory processing of verbal material to do a vocalized solution to the abstract problem.

These paradigms of the relationships of personality to the information in verbal solutions of the Gamma problem confirmed that personality is embedded in the fashioning of sequences of messages from the memory, and for processing a desired state of affairs for a socially sensitive problem. This, however, was not the major objective of the study. Instead it was to attempt to discover how the personality is embedded in memory processing of information. Toward this end, the recently discovered M unit of structure (13) of the memory concept was applied to algorithmic expressions of how information is processed in the human memory. The end product of this experiment was the forecasting of each of the nine personality scores for each of the 30 subjects. Through limits of a progression series of the M unit structure value of .1548 bit an average 3.9 per cent error between obtained and actual personality scores was realized.

A test of the validity of the M structure being related to personality was that an average of .1609 bit of information was obtained, as compared to the hypothesized value of .1548 bit of information. This prompted an analysis of trends for personality levels. A test of M unit personality data and the original information flow data for verbally processing the abstract problem showed a doubling of the number of significant linear relationships, or from nine to twenty-one coefficients. A similar increase was found for comparisons of M structure personality factors being related to the verbal material characteristics of the problem solving task.

These findings indicated the M structure of the human memory was indeed related to how the personality operates within the verbal treatment of an environment task such as the abstract problem used in this study. The question was how did it effect the personality profile of the subjects when confronted with solving a problem involving socially sensitive issues such as incestuous relationships?

A study of the shifts of linear relationships between personality factors (see Tables 3 and 13) present the end product effects of how personality factors changed in dependency between pretreatment and

treatment analyses. First, there was a loss of relationship between affiliation and succorance and nurturance. In addition, the second subgroup of self-analysis of outwardness in the environment task was dissolved to where aggression was related only to the endurance factor of the second group and to intraception. The aggression factor was now directly related to nurturance, succorance and abasement factors of the first subgroup for personality in personal feelings of guilt and interactions of help effects with friends. Note that loyalty to friends, or affiliation was now related to self-guilt, or the abasement factor of the first sub-group, and to the intraception and order factors of the second subgroup. The conclusion was that the use of an M unit of structure element in linear relationships introduced a change of the groupings of personality factors.

A comparison of linear relationships before and with the use of the M unit structure element (see Tables 12 and 13) revealed integral roles for abasement and order. These factors now served in connecting linear relationships between elements of the original linear subgroupings. Noting that order and endurance had originally (see Table 7) been linearly related to the short term chunking effect, and its' difference from the problem source and the processed chunking effect, it was now also related to the spuriousness of the short term memory channel (NOISE:X, see Table 12). As the processed chunking effect was found to be related to the long term memory useful information (see Table 6) which was now related to the M structure of aggression a pattern of useful information roles became evident.

It had been previously mentioned that the NOISE:M^1 information level has been reported (11) to identify human perception of environment tasks. The introduction of the M structure algorithm for forecasting personality factors increased the number of personality factors linearly related to the NOISE:X:M^1 information measures. Originally NOISE:X:M^1 measure was linearly related only to the absement factor (see Table 7). That relationship was positive and was interpreted to mean that feelings of self-guilt increased as there was an increase in spuriousness of the input channel, or as the subject recognized the problem of incestuous relationships as a higher level problem to be solved. The M structure personality element of abasement was found now to have a negative relationship with the NOISE:X:M^1 information measure, indicating a shift of direction for tends of processing. The only positive linear relationship for NOISE:X:M^1 with M personality factors, out of seven significant correlations (see Table 12), was now for the change factor. The change factor had been related to aggression, and with the use of the M structure element (see Table 13) now it was linearly related to the intraception factor, which is interpreted as the analysis of one's motives, to observe others or to put one's self in anothers place.

The preceding paragraph alluded to short term memory useful information originally being related to endurance and order. After the introduction of the M structure element, only order was related to short term memory useful information, in a negative fashion, whereas REAL:SS, which was not originally of any linear relationship, was now similarly related with the aggression M structure factor. This indicates respectively to short and long term memory useful information.

Referring back now to the NOISE:X:M^1 element, it can be seen that both NOISE:X:M^1 and the LTM:M^1 chunking effect) were information measures linearly related, in a positive fashion, to the long term memory useful information (REAL:SS).

The conclusion reached from these interpretations of findings was that the useful information was related to some but not all transformations of personality factors into M structure elements of personality. The effect was a shift of personality interrelationships for change being related to the factor of analyzing motives of self and self in other persons' place which became related to loyalty to others (affiliation) and that in turn to abasement (or self guilt) and to order and endurance, both which were related to the aggression M structure. Thus the M structure of memory information for personality, when introduced into this analysis, reoriented personality relationships among personality factors and that of the information processes of the verbal output for solving an incestuous, and abstract, problem.

These conclusions could be regarded as not being conservative. However, the increases of the number of significant linear relationships (mentioned above) and the fact that the basic unit value of .1543 bit of M structure used for this model was successfully used in other memory information model studies (13) should cause the skeptic to pause in reflecting on the meaning of this study.

It should be clear that personality was related to the verbal expressions used in solving a problem, including words from the problem statement and those not from the problem statement. The same claim can be made of personality relationships with the information flow of that verbal material in the vocalized statements. Pause a moment and reflect on the task of the experiment. The subject received words of the environment problem through his or her eyes, and these were processed to retrieve words from the memory. The memory output was then of a combination of the words from the two sources, the environment and the subjects' memory. The information measures described the structure of the verbal output used to express a solution of the problem. What then happened to produce the effect of increased linear relationships with the introduction of the M unit structure of memory information? Is it possible that the information unit of structure of memory information? Is it possible that the information unit of structure for values or personality and cognition (reported elsewhere, see Table 13) are interdependently operating, as discovered in this study? These propositions and the ordinary information revealed by this study could give direction to learning researchers.

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APPENDIX

Definitions of Personality Variables[7]

1. aba Abasement: to feel guilty when one does something wrong, to accept blame when things do not go right, to feel that personal pain and misery suffered does more good than harm, to feel the need for punishment for wrong doing, to feel better when giving in and avoiding a fight than when having one's own way, to feel the need for confession of errors, to feel depressed by inability to handle situations, to feel timid in the presence of superiors, to feel inferior to others in most respects.

2. aff Affiliation: To be loyal to friends, to participate in friendly groups, to do things for friends, to form new friendships, to make as many friends as possible, to share things with friends, to do things with friends rather than alone, to form strong attachments, to write letters to friends.

3. agg Aggression: To attack contrary points of view, to tell others what one thinks about them, to criticize others publicly, to make fun of others, to tell others off when disagreeing with them, to get revenge for insults, to become angry, to blame others when things go wrong, to read newspaper accounts of voilence.

4. chg Change: To do new and different things, to travel, to meet new people, to experience novelty and change in daily routine, to experiment and try new things, to eat in new and different places, to try new and different jobs, to move about the country and live in different places, to participate in new fads and fashions.

5. int Intraception: To analyze one's motives and feelings, to observe others, to understand how others feel about problems, to put one's self in another's place, to judge people by why they do things rather than by what they do, to analyze the behavior of others, to analyze the motives of others, to predict how others will act.

6. nur Nurturance: To help friends when they are in trouble, to assist others less fortunate, to treat others with kindness and sympathy, to forgive others, to do small favors for others, to be generous with others, to sympathize with others who are hurt or sick, to show a great deal of affection toward others, to have others confide in one about personal problems.

7. ord Order: To have written work neat and organized, to make plans before starting on a difficult task, to have things organized, to keep things neat and orderly, to make advance plans when taking a trip, to organize details of work, to keep letters and files according to some system, to have meals organized and a definite time for eating, to have things arranged so that they run smoothly without change.

8. suc Succorance: To have others provide help when in trouble, to seek encouragement from others, to have others be kindly, to have others be sympathetic and understanding about personal problems, to receive a great deal of affection from others, to have others do favors cheerfully, to be helped by others when depressed, to have others feel sorry when one is sick, to have a fuss made over one when hurt.

9. end Endurance: To keep at a job until it is finished, to complete any job undertaken, to work hard at a task, to keep a puzzle or problem until it is solved, to work at a single job before taking on others, to stay up late working in order to get a job done, to put in long hours of work without distraction, to stick at a problem even though it may seem as if no progress is being made, to avoid being interrupted while at work.